Research Program on Roots, Tubers and Bananas

CGIAR

ROOTS TUBERS & BANANAS

Workshop report:

Strategies for improving livelihoods through RTB postharvest technologies

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Cali, 18-22 February 2013

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Executive Summary

The need to define more specific plans for achieving the objectives of the CGIAR Research Program on Roots, Tubers and Bananas (RTB) brought together a broad range of stakeholders from 18-22 February 2013 to attend a workshop at CIAT Headquarters in Cali, Colombia. The workshop, *Strategies for improving livelihoods through RTB postharvest technologies*, was attended by representatives of the four CGIAR Centers involved in RTB – the International Potato Center (CIP), Bioversity International, the International Center for Tropical Agriculture (CIAT) and the International Institute of Tropical Agriculture (IITA) – as well as university, national and regional research organizations: CIRAD (France), NRI (UK), FONTAGRO (USA) and national partners Univalle, Uniquindio, Fedeplatano and Banur (Colombia), FHIA (Honduras), CLAYUCA Corporation (Colombia) and EMBRAPA (Brazil). Achieving a shared vision and a common understanding of institutional links and partnership opportunities to build on CGIAR work were major goals of the workshop.

The first two days of the workshop took an intensive look at issues relevant to post harvest technologies, markets and value chains for RTB. Participants presented their insights and experiences on gender, nutrition and food safety issues; improving RTB quality management and adding value in small and medium enterprises; research oriented toward consumer end user preferences; and strategies to improve livelihoods through improved value chain organization.

The workshop was punctuated on the first day by a demonstration – organized by CLAYUCA Corporation -- of the different technologies available for the postharvest processing of root crops and on the third day by a field visit to a number of plantain and cassava processing factories in Armenia. The visit gave participants an opportunity to observe the challenges faced by processors and some of the innovative solutions they are using to overcome them.

Presentations on communications and impact pathways on the morning of Day Four underlined how critical these tools will be for meeting the objectives of RTB. Communications is essential for ensuring that research builds on a detailed awareness of user needs as well as for developing and maintaining linkages among the broad community of RTB stakeholders. Impact pathways link outputs to the project goal by mapping, in a linear and logical sequence, the actions and relationships needed to achieve that goal.

The discussion of impact pathways led directly into the second half of the workshop, which was concerned with the development of actions and tools that promise to deliver important outcomes for RTB. Participants broke into groups to consider flagship products related to postharvest technology and processing; research orientated towards end-user preferences; and systemic value chain development.

Proposed products included research on the strengths and weaknesses of current post harvest technologies and an analysis of how these influence markets; new storage and processing technologies that improve efficiency and retain nutritional qualities; a knowledge portal on the nutritional and functional properties and gender differentiated consumer preferences for RTB varieties and processed products; a framework for mapping RTB consumer preferences in the diets of the poor and

market scoping for value of quality traits, including case studies; and an asset-based multi-purpose approach to livelihoods and value chain development. Participants emphasized the importance of ensuring that all research is gender-responsive, in line with the RTB's gender strategy.

The groups identified partners for product development, users, project development teams, next steps and options for funding. Participants agreed to collaborate on preparing 1-2 page concept notes for the flagship products by the end of March, with an eye to finalizing full project proposals by May.

Introduction

The CGIAR Research Program on Roots, Tubers and Bananas (RTB) targets the 200 million people around the world that depend on these crops for food security, nutrition and livelihoods. Intensive stakeholder consultation marked the process to design RTB – which got underway in early 2012 – to ensure that the research undertaken by the program meets the needs of end users.

The change process that has taken place in the CGIAR over the past five years has strongly emphasized the need for outcome-focused and performance-based research that contributes to improving the livelihoods and food security of poor farmers. Like all of the CGIAR Research Programs, RTB aspires to build on the long experience of the centers by building strong stakeholder partnerships and links with researchers and downstream users.

One of the key research themes in RTB (Theme 6) relates to post harvest technologies, value chains and market opportunities. Resolving these issues will be critical to meeting the high potential that RTB crops have to improve the wellbeing of people living in low income and marginalized areas. For example, the use of RTB has been limited until now by the bulkiness and perishability of the crops; they are difficult to store and therefore their use has tended to be restricted to harvest periods and local markets. There is much scope for establishing RTB as valuable cash crops by improving postharvest technologies, processing and the sale of preferred varieties and products. This will also require policies and strategies for linking smallholder farmers to a broader range of markets and steps to improve the efficiency of RTB value chains. It will also require due attention to the different realities and needs of men and women.

Theme 6 of RTB sponsored a workshop on strategies for improving livelihoods through RTB postharvest technologies at CIAT headquarters from 18-22 February 2013. The workshop involved a broad array of stakeholders, including representatives from the four CGIAR Centers involved in RTB – the International Potato Center (CIP), Bioversity International, the International Center for Tropical Agriculture (CIAT) and the International Institute of Tropical Agriculture (IITA) – as well as from university, national and regional research organizations: CIRAD (France), NRI (UK), FONTAGRO (USA), and national partners Univalle, Uniquindio, Fedeplatano and Banur (Colombia), FHIA (Honduras) and EMBRAPA (Brazil).

The objectives of the workshop were to share experiences with research and development in the RTB sector and to design high impact flagship products relating to three areas of research:

improving RTB quality management and adding value in small and medium enterprises; consumer and end user preferences; and strategies to improve livelihoods through stronger value chain organization.

Participant presentations

Most of the first two days of the workshop were devoted to participant presentations and discussions on key issues related to postharvest technologies, market opportunities and value chains for roots, tubers and bananas. These included the very important crosscutting issues of gender, nutrition and food security, which underpin all of the work undertaken in Theme 6 and indeed in RTB as a whole. The key findings arising from each session are summarized below. Greater detail can be found *in* Annex I.

Gender

The CGIAR has called for all CRPs to mainstream gender into their activities. The goal is to address both the consequences and causes of gender equality in order to achieve social justice and efficiency. The RTB's gender strategy seeks to provide equal access for men and women to knowledge, capacity building and market opportunities, while ensuring that any technologies or methodologies it develops take into account their different realities and needs. Theme 6 undertakes gender-integrative research, which includes gender dimensions, and gender-strategic research, which is specifically concerned with examining the links between RTB and gender relations, with the goal of achieving development outcomes that are both gender-responsive (both men and women benefit and neither are harmed) and gender-transformative (gender relations are changed, particularly gender inequity).

The CGIAR has established a gender performance fund that will provide up to $25 million over the next three years to embed high quality gender research in the CRPs. The issues being addressed by Theme 6 of RTB – post-harvest technologies, markets and value chains – have important gender implications and the RTB gender team has submitted a proposal to receive some of these funds. It will be important to keep a watching brief on the progress of gender mainstreaming in the program and to ensure that there is adequate capacity available for implementing the RTB gender strategy. Achieving gender transformation will depend heavily on finding the right partnerships.

Nutrition

Strategies to achieve food security often concentrate on increasing production of basic staples without paying adequate attention to their nutritional qualities. An effective nutrition strategy needs to take a 'food basket' approach, based on the spectrum of foods that people in rural and urban settings actually consume. The safety and nutritional value of food can be affected the quality of the raw materials, diseases and pests, poor processing and storage conditions and cooking methods.

There are likely to be complementarities between RTB and the CGIAR research program on agriculture for nutrition and health and it will be important to build on these for synergy and to avoid duplication. While it is known that the nutritional composition of RTBs can be affected by postharvest impacts, more research is needed, including concerning the retention or degradation of provitamins A in biofortified RTB crops post-harvest. Biofortification should always be seen as a complement to promoting the use of highly nutritious crops or crop varieties.

Improving RTB quality management and adding value in small and medium enterprises

The potential of RTBs to contribute to livelihoods and food security is limited by poor storability and bulkiness, seasonality and weak value chains. Addressing these limitations can contribute significantly to enterprise development and thus to increasing the sale and use of these crops.

Partnerships with private sector enterprises – of all sizes – are key to linking research to development and are a major challenge for RTB. Over the medium term, tools will be needed to optimize postharvest processing, including RTB storability, root handling and the shelf life of intermediate products. Research is needed on better waste management and the use of root peels, starch residues and leaves as animal food to bring greater benefits to processors and producers. The development of such tools and methodologies should be based on a combined assessment of environmental, technical and socioeconomic constraints. Pilot testing and training of value chain actors in postharvest approaches and technologies will be a priority for Theme 6. Introducing village processing centers that make use of cleaning, milling and drying machines will increase farmer incomes and significantly reduce the burden on women, who are most often responsible for hand peeling RTBs, such as cassava.

Research oriented toward consumer and end use preferences

There are many uses for RTBs. They can be consumed fresh, baked or fried, processed into flour or used in baby foods. The uses vary from place to place and by production system; knowing exactly what farmers, processors and consumers want and need is critical to ensuring that the right breeding strategies are adopted. Involving end users – both women and men – in all stages of pre-and postharvest processes will contribute to a better understanding of user needs, including gender preferences.

Creating demand for RTB products calls for better links between users and markets and the resolution of any issues related to food safety and quality control. Research is needed to support the development of processes and guidelines for assessing and monitoring food safety and quality. Inexpensive methods for measuring consumer acceptance are needed, as are ways to test and promote new products among rural audiences.

Strategies to improve livelihoods through better value chain organization

A value chain is a strategic collaboration among market actors in order to achieve certain objectives over the long term. It is demand driven and characterized by shared commitment and a high level of trust among participants. Value chains vary greatly – in terms of interventions and impact pathways – from crop to crop and country to country. A single income-based value chain approach to livelihoods improvement risks overlooking some of the assets that contribute to wellbeing for smallholder farmers. Including multiple value chains in the work of RTB could also increase opportunities for cross-CRP and cross-regional collaboration.


Oyo, Nigeria, gari sellers

Research is needed on the roles of actors and service providers in different value chains, as well as on consumer preferences, market opportunities and the constraints and bottlenecks at various points along the chain. Tools are also needed for the gender-differentiated assessment of the production and commercial risks associated with the value chains for RTB.

There are a number of natural links and areas of common interest between RTB and the Policy, Institutions and Markets CRPs that should be explored. These include measuring impact in value chains; gender inclusive value chain strategies; value chains and improved nutrition; the role of underutilized crops; and food safety in value chains.

Visit to the postharvest processing facilities of CLAYUCA/CIAT

In the afternoon of the first day, CLAYUCA Corporation organized a demonstration of the different technologies available for the postharvest processing of root crops. This included machinery – developed by CLAYUCA – that can process high quality cassava flour without the need to remove the peels until the final stage, reducing costs and environmental impact. A second CLAYUCA technology produces ethanol from cassava roots for local use in generating bio-energy. Participants tasted a number of bakery products prepared with high quality flour from cassava, sweetpotato and yam.

Field trip

An all-day field trip to Armenia, 170 km from CIAT, introduced workshop participants to six plantain and cassava processing factories. A number of issues arose during the course of the visit that will be important to explore as RTB further unfolds. Tools are needed to measure the extent to which the research products generated by the CRP are picked up by the private sector. Strong guidance is needed to address worker health issues, such as fumes and air extraction.

Successful business models – such as the 'just in time' model operated by the Finca Santa Clara – need to be documented and replicated elsewhere as appropriate. This model creates items to meet demand, not for surplus or in advance of need. Planto S.A.S. (Montenegro) uses simple processing methods that add value to their products and reduce quality loss. Finca la Diana uses livixiate from banana rachis to lessen the incidence of black sigatoka disease and reduce the need for fertilizer (this method was developed through CIAT research).

Communications and impact assessment

A session on communications and impact pathways underscored the critical importance of these tools to the success of RTB. Participants tried out an 'elevator pitch': a quick, succinct summation of what the CRP has to offer. The pitch – so named because it should be no longer than an average elevator ride – can be a very effective way of winning new supporters. It requires simple, compelling language, fresh messages, preparation and practice. An elevator pitch should identify the problem and the solution offered by RTB and include a call to action. It should be tailored to the needs and interests of the people receiving the pitch. Continually perfecting the elevator pitch will ensure that RTB partners will always be prepared to put their best feet forward as the program grows and expands. Workshop participants requested some on line resources from CRP communications staff for elevator pitch development.

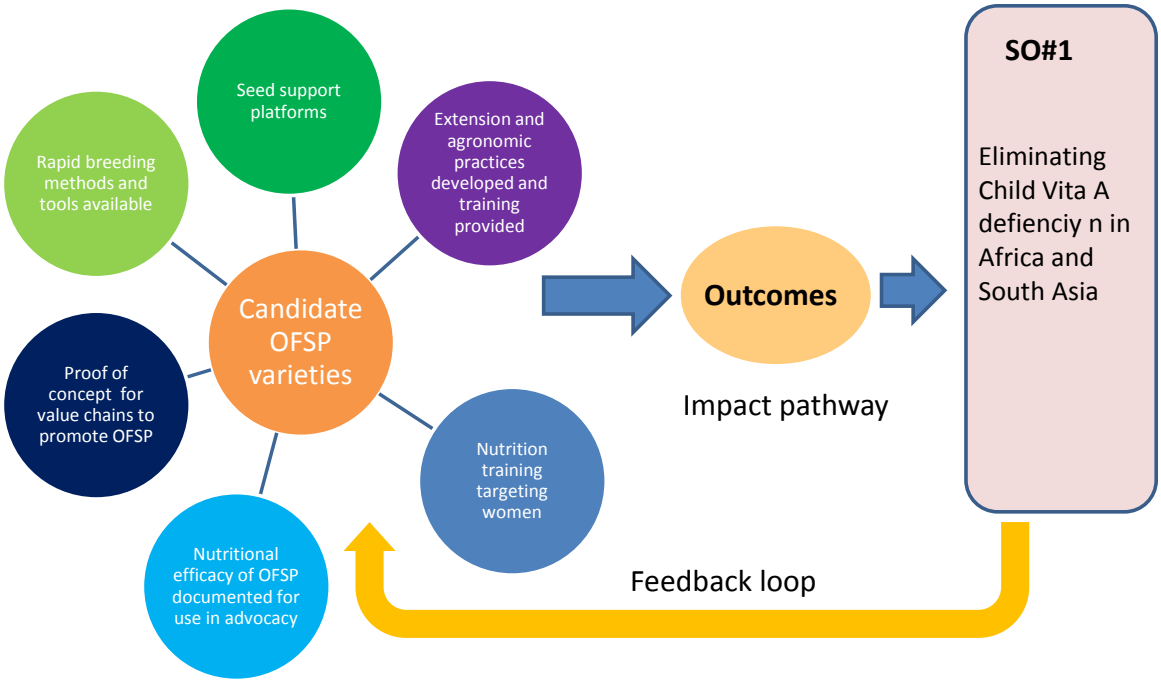
Participants also discussed the RTB blog as a major outlet for sharing the goals and accomplishments of the program. Potential blog topics include gender issues of concern to RTBs, breeding products, genebank uses, seed certification, models for market development, marketing and value chains, bottlenecks to the adoption of new technologies and waste management. Veronique Durroux of CIP will follow up with the group and will work of the development of blogging rules, e.g. concerning cross posting and languages, with the other centers.

Impact pathways link outputs to the project goal by mapping, in a linear and logical sequence, the actions and relationships necessary to achieve that goal. Research for development projects seek to bring about important and positive change, and impact pathways map out how knowledge and research products must scale out and scale up to achieve development objectives.

The flagship projects envisaged for RTB should integrate and synergize existing work by CGIAR and its partners. They should have significant, measurable and time bound outputs that are available to a well-defined group of next users, including researchers and development actors. The impact pathways for these outputs should lead to their adoption by a very large group (100 000+) of end users or to other significant benefits.

Flagship products

During the second half of the workshop, participants broke into groups to consider flagship products related to postharvest technology and processing; research orientated towards end-user preferences; and value chain development. The groups came together on the final day to present their work in plenary.



Connecting postharvest technology with markets and users

The first proposed flagship project is an analysis of the postharvest technologies currently being employed for RTB crops. This will involve assessing the strengths and weaknesses of various RTB technologies, including how well they link to markets, and exploring the different roles played by men and women in processing and the likely adoption of particular technologies based on gender. The analysis will help to prioritize the postharvest research needs of the RTB community and will identify the technologies with the potential for significant impact. Beneficiaries will include RTB researchers, processors and consumers, as well as downstream partners, such as development NGOs. Dominique Dufour and Thierry Tran will be responsible

for coordinating the next stages of project and proposal development with focal points from Bioversity, CIAT, CIP, CIRAD, Clayuca, ILRI, IITA, NRI and UniValle.

Outputs

- Standard template for collecting information on PH technologies;
- Criteria for selecting high-impact value chains to analyze, e.g connection to markets, gender issues, efficiencies;
- Selected case studies:
  - Gari processing: Nigeria;
  - Sweet potato processing: Mozambique, Rwanda;
  - Cassava starch processing: Vietnam, Thailand;
  - Plantain processing: Colombia, Nigeria;
  - Yam flour processing: Nigeria, Ghana;
- Online system for information sharing on RTB postharvest technologies.

The second proposed flagship product for this group involves improving the efficiency of postharvest processing to ensure that nutritional quality can be retained. There is a wealth of evidence that storage conditions, dryers, pressers and fryers in many small to medium enterprises are less than optimal in Africa, Asia, Latin America and the Caribbean. Another element of the flagship product involves the development of a toolkit for residue management. The waste of cassava and plantain peels (which can be used as animal feed) and pollution from wastewater are challenges for many small to medium industries. The potential benefits of these activities include cost and environmental efficiencies; greater product stability and longer shelf life; stronger value chains and increased farmer incomes.

Potential partners for the second proposed flagship product in this group include CIAT, CIP, ILRI, IITA, CIRAD, UniValle, Clayuca, NRI, local universities and downstream partners, such as private companies and NGOs. The users will include equipment manufacturers, RTB

processors, cooperatives, farmers, national research programs and food regulatory agencies. The next steps will involve taking stock of current postharvest processing practices for a range of crops and products (gari, starch, cassava flour, farinha, orange flesh sweet potatoes, pounded yam flour, fufu, crisps, matooke, aloco, frozen cassava, cassava chips…). As with the previous product, Dominique Dufour and Thierry Tran will be responsible for coordinating the next stages of project and proposal development.

Outputs

- Diagnostic toolkit for assessing the economic and technological efficiencies (product quality, energy) of different postharvest technologies;
- New postharvest processing models that are applicable to different regions and contexts;
- Demonstration and capacity development for building and testing prototypes (pilot-scale tests to be held in commercial environments);
- Guidelines for improved storage practices under different climate conditions.
- Demonstration and testing of prototypes for the detoxification of peels and the use of waste for bioenergy (biogas, biofuel), animal feed production (silage) and mushroom production;
- Procedures and decision tools for the economic use of residues;
- Technologies for effluent management adapted to different production scales;
- Case studies on the profitability of residue use to target beneficiaries;
- Assessment of the nutritional and anti-nutritional values of residues in animal feed.

Research oriented towards end user preferences

The first flagship product proposed for end users is a knowledge portal that documents the nutritional and functional properties and the gender and livelihood differentiated consumer preferences for RTB varieties and products. The knowledge portal would also include information on the impact of processing on nutritional and functional qualities. The information included in the portal will draw on extensive user inputs and market trends and could guide breeding strategies to favour varieties that are highly acceptable to processors and consumers.

The information can also be used to guide policy and will provide a basis for certification or recommendations concerning nutrition, food safety and the functional properties of RTBs.

Potential partners include advanced research institutes for food science and industry, regulatory agencies, national nutrition institutes, retailers, USDA, NRI and CIRAD. Likely users include the International Society for Tropical Root Crops, RTB development projects, public health and consumer protection agencies, retailers, exporters, the animal feed, starch and food processing industries, scientists, policymakers and donors. The next steps are to review the current state of knowledge on the nutritional and functional properties of RTBs and the available capacities for carrying out the project.

Outputs

A knowledge portal is developed and managed that documents the favoured nutritional and functional properties for RTB varieties and processed products, including:

- a list of preferred traits from consumers, food scientist, industry, public health officials;
- protocols for analysis, including the contributions of environment and management to any variation.

The second flagship project proposed for end users is a tool for mapping the preferences of poor consumers for RTB varieties and products. The tool should be flexible enough to address gender and region-specific needs in order to guide breeding strategies that increase consumer and processor acceptance of RTBs. The group ran out of time to finalize its thinking on this project; follow up work will involve thinking more about potential users, partners and capacity needs. Bussie Maziya Dixon of IITA and Clair Hershey of CIAT will coordinate follow up for both of the proposed flagship projects.

Outputs

- A better understanding of consumer preferences for RTB varieties and products to enable targeted research;
- The exchange of knowledge about RTB traits and uses among researchers in different regions;
- Greater adoption of RTB varieties and products;
- Improved capacity to measure and monitor the adoption and benefits of RTBs.

Strategies to improve livelihoods through better value chain organization

Most value chain approaches are concerned solely with income; this does not reflect the fact that livelihoods have other determinants and that there are tradeoffs between market orientation (which calls for specialization) and food security (which requires diversification). The third group chose to focus on an approach that builds assets, such as food and nutritional security, gender equity and climate change resilience, through multi-chain, multi-purpose subsistence and market-oriented livelihood options. The approach should enable more resilient livelihoods, with higher food and nutrition security among smallholders whose farming systems are RTB-based and greater gender equity at the household level and along value chains. The users of such an approach would include research and development agencies, donors, regional organizations and NGOs. Dietmar Stoian of Bioversity will coordinate the next stage of development of the proposed flagship project.

Outputs

A tried and tested multipurpose, multi-value chain approach to livelihoods development. This will require:

- A review of existing policies, cases and methodologies for livelihoods and value chain development;
- Tested and validated tools and models for characterizing livelihoods needs and options at the household level, e.g. household/community asset assessments, gender analyses, market studies, priority setting methodologies, risk analyses, farming systems resilience/climate vulnerability/ nutrition gap analyses;
- *Ex ante* and *ex post* assessments of the impact of the approach on poverty, social, environmental, gender and other development objectives;
- Training materials and capacity building for the users of the tools and models;
- Information and promotional materials.

Next steps

Participants agreed to move ahead to further develop the proposed flagship projects, with coordination provided by Dominique Dufour and Thierry Tran (postharvest technology) Bussie Maziya Dixon and Clair Hershey (end user preferences) and Dietmar Stoian (better value chain organization). Next steps include the development of a 1-2 page concept note (by the end of March) and a full project proposal (by late May).

ANNEX 1. SUMMARY OF PARTICIPANT PRESENTATION SESSIONS

Strategies for improving livelihoods through RTB postharvest technologies

Participant presentation sessions, 18-19 February 2013

Gender

General concepts

- The goal of gender mainstreaming is to achieve gender equality for reasons of social justice and efficiency.
- Technologies/methodologies should be geared to the different realities and needs of men and women.
- Focus should be on both gender-integrative and gender-strategic research.
- Target both gender-responsive and gender-transformative outcomes
- Integrate biological and social science approaches.
- Address both the consequences and root causes of gender inequality.
- Encourage global gender research to play more attention to agriculture and to RTB in particular.

Status and challenges for RTB /Theme 6

- Theme 6 includes both gender integrative and strategic research.
- Ensure that RTB gets additional funding from the Consortium gender fund.
- Review status/progress of gender mainstreaming in RTB.
- Assess human resources capacities and support capacity development for implementing the RTB gender strategy;
- Ensure that gender is integrated in the postharvest sub-themes.
- Find the right partnerships to help bring about gender transformation.

Nutrition

General concepts

- Food security strategies most often focus on basic staples without paying adequate attention to nutritional qualities.
- It is important to take a food basket approach to a long term nutrition strategy, based on the spectrum of crops actually consumed by people in rural and urban settings.
- Food safety and nutritional value can be influenced by the quality of the raw materials, diseases and pests, poor processing and storage conditions and cooking methods. Particular threats during harvesting include maturity of tubers, mechanical damage and exposure to light.

Status and challenges for RTB /Theme 6

- It will be important to identify complementarities between RTB and the CGIAR Research Program on Agriculture for Nutrition and Health.
- The retention or degradation of provitamins A in biofortified RTB crops post-harvest is a major issue.
- Creating demand for improved seed requires a clear understanding of markets and value chains and detailed delivery and sales plans.
- Biofortification should be seen as a complement to promoting the use of highly nutritious crops or crop varieties.
- Research is needed on postharvest impacts on the nutritional composition of RTBs.

- Partnerships with food companies can promote new products based on nutritious crops.
- School feeding programs can improve student nutrition and benefit smallholder farmers involved in producing foods for school programs.

Improving RTB quality management and adding value in small and medium enterprises

General concepts

- The potential of some RTBs (e.g. sweet potato) to contribute to food security is limited by poor storability and bulkiness, seasonality and weak value chains.
- Value chain, postharvest technology and enterprise development perspectives are all needed to promote RTBs for food security and livelihoods.
- The environmental impact of starch production and other postharvest processes can be significant, mostly due to water and energy use.
- The value chain approach is complex and takes time; however the impacts are sustainable.

Status and challenges for RTB /Theme 6

- Finding common ground with the private sector is a major challenge for RTB.
- Partnerships with investment programs, such as IFAD, can help link research outputs with development outcomes.
- The development of a diagnostic tool to assess energy use by small and medium enterprises is needed and is a quick win.

- Over the medium term, a tool is needed to optimize postharvest processing based on the assessment of environmental, technical and socioeconomic constraints.
- Research is needed on the better management and use of root peels from RTBs and residues from starch extraction.
- The establishment of rural root and tuber processing centers can reduce the burden on women and can improve farmers' livelihoods, including by reducing energy costs through the production of biogas.
- Pilot testing and training of value chain actors in postharvest approaches and technologies should be a priority for Theme 6.

Research oriented toward consumer and end use preferences

General concepts

- Until now, breeding has been mostly concerned with increasing productivity and less with meeting farmers' other needs.
- The rich diversity of uses for RTBs and the post-harvesting technologies employed have a direct impact on breeding strategies.
- Ensuring quality control throughout postharvest processing will improve health and nutrition, generate user confidence and increase access to local and export markets.
- A value chain for food security entails the access, availability, quality and use of food. Each of these components has important implications for end users.
- User needs will vary from place to place and by type of production system.

Status and challenges for RTB/Theme 6

- A better understanding of the needs of farmers, processors and consumers is required. Involving end users in all stages of pre-and postharvest processes will contribute to this understanding.
- Efforts to better link users to markets will require significant adaptation of postharvest technologies to address issues related to the link between food safety and quality control new product development and the better use of residues. Research is needed to improve the storability and postharvest handling of RTBs and to increase their shelf life and that of intermediate products. An important starting point will be to collect and analyze baseline data.
- Ensuring that user preferences are gender sensitive is a major challenge.
- Breeding priorities should be based on the needs of smallholder farmers and consumer preferences and have the goal of reducing gender inequities.
- Research is needed to define the parameters for 'quality' and for characterizing traits of taste and smell.
- Postharvest traits should more explicitly inform breeding programs and should be assessed in the context of end user needs.
- It is important to co-evaluate postharvest technologies with processors to ensure that they meet industrial needs.
- Demand creation requires strong links between farmers and markets and vice-versa.
- Traditional knowledge should be enlisted to guarantee the efficiency of processes, limit environmental impacts and ensure consumer acceptance of new products.
- Rapid, low cost methods for measuring consumer acceptance are needed as are ways to test and promote new products among rural audiences.

Strategies to improve livelihoods through better value chain organization

General concepts

- A value chain is a sequence of related business activities from the provision of specific inputs for a particular product to primary production, transformation, marketing and final consumption.
- A value chain differs from a supply chain in being a strategic collaboration between participating organizations in order to achieve certain objectives in the market over the long term for the mutual benefit of the participants. A supply chain involves the existing relationships between actors in the market.
- A value chain is demand driven and is characterized by shared commitment and a high level of trust among participants.
- Value chain types can vary significantly from crop to crop and country to country, with different levels of intervention and impact pathways.
- There are limitations to focusing – for research purposes – on a single value chain approach based only on livelihoods.
- Livelihood assets are vital for household resilience.
- There is broad consensus on the benefits of linking smallholders to modern markets.

Status and challenges for RTB/Theme 6

- Organized and systematic value chain methodologies are needed to understand the roles of actors and service providers; consumer preferences and market opportunities; and constraints and bottlenecks at various points along the value chain.

- A challenge is the identification of positive feedback loops where establishing one asset leads to building another.
- It is critical to design clear impact pathways before engaging in concrete interventions.
- Gender differentiated research can help to minimize the tradeoffs between smallholder subsistence (which calls for diversification) and value chains (which are based on specialization).
- Including multiple value chains in the work of RTB could increase opportunities for cross-CRP and cross-regional collaboration.
- The Participatory Market Chain Approach offers a powerful methodology for generating collaborative innovations in market chains and could be further tested and refined by RTB.
- Creating alliances with political decision makers and the providers of technical, business and financial services is critical to value chain development.
- Multiple partners are the key to success!
- Tools are needed to enable the gender differentiated assessment of the production and commercial risks associated with the value chains for RTB.
- There are a number of natural links and areas of common interest between RTB and Policy, Institutions and Markets CRPs that should be explored. These include measuring impact in value chains; gender inclusive value chain strategies; value chains and improved nutrition; the role of underutilized crops; and food safety in value chains.
- Data is needed to document which companies are using high quality cassava flour. The technology is a decade old and it would be useful to know who is and isn't using it (and if not, why not).
- A key question concerns the extent to which business models can be an effective tool for rural poverty reduction.

ANNEX 2. WORKSHOP PROGRAM

- Coordination: Dominique Dufour
- Facilitation: Simone Staiger and Sophie Alvarez, both CIAT
- Session leaders: Clair Hershey-CIAT, Thomas Zum Felde-CIP, Olivier Gibert (CIRAD) , Bussie Maziya Dixon (IITA), Matthias Jager (Bioversity), Thierry Tran (CIRAD), Merideth Bonierbale (CIP), Stoian Dietmar (Bioversity)
- Documentation, writing of concept notes: Ruth Raymond, Green Ink.

Agenda

Day 1 – February 18-02-2013 Sala Nariño, Conference Area

8:00 Welcome (Joe Tohme, Director Agrobiodiversity research area, CIAT and Graham Thiele, Director of RTB)

8:20 Introduction participants (Simone Staiger)

8:40 Table talks to know each other, share workshop expectations, and screen RTB post-harvest – key issues) (Simone Staiger)

9:15 A short introduction to RTB and workshop expectations, questions & answers (Graham Thiele)

10:00 Break

A focus on People

10:30 **Gender** (Kayte Meola-CIAT, Anne Rietveld-Bioversity) 15-minute presentations and discussion
Session leader: Merideth Bonierbale (CIP)

11:30 **Nutrition and food safety** (Wolfgang Pfeiffer-Harvest Plus, Bussie Maziya-Dixon-IITA, Gabriela Burgos-CIP, Luis Augusto Becerra Lopez-CIAT, Marilia

Nutti-Embrapa) 15-minute presentations and discussion
Session leader: Thomas Zum Felde (CIP)

13:00 Lunch

13:45 Visit to Clayuca

15:15 **Improving RTB quality management and adding value in small and medium enterprises** (Simon Heck-CIP, Campilan Dindo-CIP, Thierry Tran/Dominique Dufour-CIRAD, Keith Fahrney-CIAT, Bernardo Ospina-Clayuca, Keith Tomlins-NRI, Adebayo Abass-IITA)

15-minute presentations
Session leader: Olivier Gibert (CIRAD)

17:00 Discussion

18:00 Closure

Day 2 – February 19-02-2013 Sala Nariño, Conference Area

8:00 Brief summaries of Day 1 by session leaders

8:30 **Research oriented toward consumer and end-user preferences** (Hernán Ceballos-CIAT, Peter Kulakov-IITA, Merideth Bonierbale-CIP, Antonio Lopez de Monte-IITA, Juan Fernando Aguilar-FHIA, Olivier Gibert/Charles Staver-CIRAD, Keith Tomlins-NRI)
15-minute presentations
Session leader: Bussie Maziya Dixon (IITA)

10:00-11:00 Break at the RTB quality Lab

11:00 End-user preferences (cont.)

12:00 Discussion

13:00 Lunch

14:00 **Strategies to improve livelihoods through improved value chain organization** (Dietmar Stoian-Bioversity, André Devaux-CIP, Mignouna Djana-IITA, Hugo Li Pun-Fontagro, David Phillips-NRI, Mark Lundy-CIAT)
15-minute presentations
Session leader: Matthias Jager (Bioversity)

16:00 Discussion

17:00 Wrap-up and closure

17:30 Welcome cocktail at the Piano Bar (Armando Samper Room)

Day 3 – February 20-02-2013

Field trip to Armenia (plantain & cassava processing factories visit)

Day 4 – February 21-02-2013 Sala Sinú, Conference Area

8:30 RTB Communications (Véronique Durroux-CIP, Nathan Russell-CIAT)

9:15 Why Impact Pathways? Graham Thiele, presentation and discussion

10:00 Product development and impact pathway analysis

- What elements do we have so far (Ruth Raymond-Green Ink. and Simone Staiger-CIAT)
- Guidelines for group work and discussion (Graham Thiele)

10:45 Break

11:00 Group work:

1. **Improving RTB quality management and value adding in small and medium enterprises** (Leader: Thierry Tran-CIRAD)
2. **Research oriented towards end-user preferences** (Leader: Clair Hershey-CIAT)
3. **Strategies to improve livelihoods through improved value chain organization** (Leader: Dietmar Stoian-Bioversity)

13:00 Lunch

14:00 Plenary check on group work, cross-fertilization

15:00 Group work (cont.)

16:30 Field visit CIAT campus – Cassava field (Fernando Calle, Nelson Morante)

Day 5 – February 22-02-2013 Sala Sinú, Conference Area

9:00 Plenary check on group work, cross-fertilization

Agenda of Day 5 depends on where we stand at the end of Day 4.

Evening: Salsa show “Delirio”

WORKSHOP PRESENTATIONS

Presentations of the workshop can be consulted on Google Drive using the following link here

ANNEX 3. LIST OF PARTICIPANTS

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RTB Postharvest Workshop
CIAT, Palmira, February 18-22, 2013
CGIAR
RESEARCH PROGRAM ON
Roots, Tubers and Bananas
CIAT

ANNEX 4. WORKSHOP CONCEPT NOTE

Objectives:

- Building a team between researchers and downstream partners for high-impact value adding to roots, tubers and bananas (RTB)
- Sharing advances of research and development work and constructing impact pathways for four RTB products:
  - RTB quality needs based on gender-differentiated end-user preferences
  - Ecofriendly technologies and institutional solutions for RTB quality management and value adding
  - Gender-differentiated framework and tools to manage post-harvest and value chain risk for RTB
  - Assessing gender-specific poverty and food security impacts of value chain development
- Preparing concept notes for impactful research on the four products

18-19 February: Exchange of Experiences and Introduction to Impact Pathways

Workshop introduction and objectives: **Joe Tohme & Graham Thiele**

Exchange of experiences – Presentations by participants in RTB theme 6

1- Gender-differentiated assessment tool to determine quality needs based on end-user preferences in RTBs

Factors that are conducive to nutrition and health, or specific traits of **consumer acceptability** have seldom been well defined or characterized. Similarly, analyses of end-user preferences have rarely been gender-specific. RTB have multiple **healthy components**, including complex starches, vitamins and minerals, and antioxidants, as well as healing properties. These traits have been documented on very few germplasm accessions, nor do we know the extent to which preferences for these vary according to gender. A survey of genetic diversity will reveal the extent of these traits, their relation with gender-specific consumer preferences, and the **potential for genetic improvement**. Quality characteristics are being defined and a strategy for genetic improvement is developed. Breeders will have access to source **germplasm** for these **traits**, and in the future consumers will benefit from **new varieties with acceptability**, improved nutritional value and better productivity.

Issues to be addressed:

- Inadequate quantitative data on the composition of RTB, regarding functional, nutritional and bioactive components
- Lack of gender-differentiated knowledge on local uses, acceptability, processing, reported health effects, and how nutrients and bioactive components relate to these.
- Poor understanding of gender-differentiated end-user preferences for specific traits
- Need for development of new products and technologies based on gender-differentiated knowledge and laboratory analysis
- Need for reinforcement of existing partnerships (South-South between researchers) and forging of new ones, including alliances researchers and development practitioners and private sector partners

Experiences exchange:

Improved RTB & leaves quality at CIP: Merideth Bonierbale

Improved RTB & leaves quality at IITA: Peter Kulakow & Antonio Lopez

Improved RTB & leaves quality at CIAT: Hernan Ceballos & Luis Augusto Becerra

Banana quality & consumer preferences Bioversity/CIRAD: Olivier Gibert & Charles Staver

Biofortification of RTB. HARVESTPLUS: Wolfgang Pfeiffer

Nutritional value of RTB Beatriz Ekesa, Bussie Maziya-Dixon, Teresa Sanchez, Gabriela Burgos, Thomas zum Felde

Common strategies Wrap-up: **Clair Hershey**

2- Ecofriendly technology and institutional solutions for RTB quality management and value adding in small and medium enterprises

2.1 Re-engineering of key post-harvest operations in order to reduce energy consumption and environmental impacts

The objective is to **characterize** and **improve energy and water efficiency** of food preservation operations such as drying, parboiling/precooking, and rasping/grinding of RTB. This will be done through **re-engineering of key operation units**, accompanied by

environmental impact assessments using **life cycle analysis** (LCA) and **carbon footprint tools** before and after modifications, in order to demonstrate the benefits of the process modifications.

The first task aims at **characterizing the energy and water requirements** and **efficiency**, as well as the **environmental impacts** and **related socio-economic constraints** of current key post-harvest operations. The technical diagnostic methodologies will be formalized into scientific operation procedures in order to ensure their transferability to other value chains.

The objective of the second task is to **re-engineer selected key post-harvest operations** to improve water and energy efficiency, using solar radiation and biomass from agricultural residues as energy sources. The environmental benefits of the improvements will be demonstrated by LCA impact assessment.

2.2 Appropriate process technologies to improve food security and quality

This activity aims at developing and improving **traditional technologies** to be used on farms or by rural SMEs, with a view to **adding value** to RTB. The first task aims at **studying sustainable food processing practices** allowing farmers to add value to part of their crops. **Dehydration** (solar drying, cooking, frying, candying) and **fermentation processes**. The second task aims at **improving technologies already used by rural SMEs**, such as technologies for flour production from RTB, and at developing innovative technologies such as vacuum frying or biomolecule extraction. The activity will consist in implementing **technical improvement**, in developing **alternative processes** or in implementing **Good Manufacturing Practices.**

Q**uality parameters** relevant for consumers, export markets and local industries will **be evaluate**d using simple methods for rapid quality monitoring.

2.3 Voluntary and mandatory standards for quality management and value adding

In the agricultural sector, with rapid decay of fresh products, food quality is heavily dependent on the **logistics systems** connecting the various stages in food chains. Chains of (semi-) perishable products suffer from **high risks of quality deterioration**, with storage, handling, transport and logistics conditions greatly affecting freshness and shelf life of the produce. **Logistics integration** between players in the chain concerns exchange of planning data regarding harvesting, storage and transportation, cold chain maintenance and use of (tele)communication technology such as mobile phones, which may strongly improve logistics planning, thereby enhancing the quality of fresh products.

Given the variability of product quality performance and waste production throughout the chain, producers need to **seek simultaneous linkages** with different markets. In this respect, heterogeneity in product quality and valorization of by-products and rest products can become an **opportunity** for (smallholder) **income development** if the inherent variability on the supply side is better matched with the different **specific market segments.**

To achieve better alignment of diverse product quality with differentiated market niches, players may aim for **compliance with differentiated quality standards**. Usually**,** production standards to be adopted in order to safeguard food safety are launched by **governmental institutions**, whilst standards that differentiate food quality (grade, origin, process characteristics) are implemented by **private players** in the chain, such as retailers or processing industries. However, on both counts **quality enforcement** is heavily dependent on the possibility to **identify** and **measure quality aspects.**

Experiences exchange:

Technology development and quality management at CIAT: **Keith Farnhey & Dominique Dufour**

Technology development and quality management at CIP: **André Devaux & Kirimi Sindi**

Technology development and quality management at IITA: **Adebayo Abass, Joseph Rusike, Emmanuel Oladeji Tahirou Abdoulaye & GbasseyTarawali**

Technology development and quality management at CIRAD: **Thierry Tran & Dominique Dufour**

Technology development and quality management at CLAYUCA: **Bernardo Ospina**

Technology Development and quality management at NRI: **Keith Tomlins**

Common strategies? Wrap-up: **Christopher Wheatley or Guy Henry**

3- Gender-differentiated framework and tools to manage post-harvest and value chain risk for RTB

Losses do not only occur at the farm level (production and yield losses) but also downstream the value chain. Such post-harvest, processing, distribution and consumption losses are often the result of risks whose magnitude is often poorly understood, let alone adequately managed by different value chain actors. Female farmers, food processors, traders, and consumers tend to be more exposed to these risks than their male counterparts. There is a general lack of adequate institutional frameworks and tools that help assess and minimize such risks. Moreover, only few of the existing frameworks and tools provide for gender-differentiated risk assessment and management. There is an urgent need for the identification of enabling

institutional frameworks and a tool box for gender-differentiated assessment and management of risks associated with post-harvest and value chain operations.

Experiences exchange:

Value chain risk assessment and management at CIAT: **Mark Lundy**

Value chain risk assessment and management at CIP: **André Devaux & Kirimi Sindy**

Value chain risk assessment and management at Bioversity: **Anne Rietveld & Dietmar Stoian**

Value chain risk assessment and management at CRS**: Shaun Ferry**

Value chain risk assessment and management at Swisscontact: **Ivan Rodriguez**

Common strategies? Wrap-up: **Veronica Gottret**

4- Assessing gender-specific poverty and food security impacts of value chain development

Value chain analysis and development has gained momentum over the past five to ten years due to its alleged potential to reduce rural poverty. In many cases, however, there is little scientific evidence for the presumed poverty impacts. In general, there is a lack of adequate tools for assessing such impacts. Existing tools tend to be simplistic by focusing on employment and income generated through participation in a given value chain, rather than broader impacts on smallholder livelihood assets and food security. More sophisticated tools that allow for these aspects have yet to deepen gender-specific assessment and be applied beyond the scale of a few isolated case studies.

Experiences exchange:

Value chain impact assessment at CIAT: **?**

Value chain impact assessment at CIP: **Kirimi Sindi**

Value chain impact assessment at Bioversity: **Dietmar Stoian**

Value chain impact assessment at ICRAF: **Jason Donovan**

Value chain impact assessment at Oxfam: **Kyle Cahill**

Value chain impact assessment at NRI: **David Phillips**

Common strategies? Wrap-up: **Shaun Ferry**

Introduction to impact pathways: **Graham Thiele**

20 February: Field trip.

Visit of cassava breeding field at CIAT
Cassava production for fresh consumption: AGROVELEZ
Cassava starch production Unit in Cauca region, Life Cycle analysis.
Quality laboratory, Facilities

21-22 February: Vision of Adding Value to RTB – Future Research and Impact Pathways

Building a Team on RTB postharvest and value chain research and development
Defining impact pathways for the four topics
Determining key elements of the concept notes for 4 quick win proposals for Theme 6 – Adding Value to RTB.

22 February Night – closing session.

Salsa Show: DELIRIO

ANNEX 5. RTB TEAM AND PARTNERS DISCUSS POSTHARVEST ACTIVITIES

Partners' inputs help kick-start the RTB work agenda on postharvest activities.

Packaging cassava croquettes

Peeling plantains for the agroindustry, processing cassava with efficient equipment, accessing markets and offering varieties that consumers like: these are just a few of what can be classified as 'postharvest activities'. All these aspects are what drew together the 50+ participants to the long-awaited workshop on 'Strategies for improving livelihoods through RTB postharvest technologies' that took place last month at CIAT Headquarters in Cali, Colombia. The workshop was the first time the RTB team would meet around a table to discuss these topics and define specific plans.

Expectations were high, as the activities that fall under the RTB Theme 6 of research touch upon many areas of interventions, as shown by the diversity of stakeholders and presentations. No serious exchanges could have taken place without the presence of partners, who gave first-hand accounts of their work in the field and presented their insights and experiences on nutrition, food security issues, gender, consumer and user preferences, environmental aspects, value chain organization, and quality management in small and medium enterprises.

"With 32 professional staff with root and tuber crops and banana expertise, we at NRI – UK's National Resources Institute – are big players on roots and tubers, and we work with farmers and industries on site," explained Keith Tomlins, before elaborating on his interest in partnering: "Helping poor people is our driving force, and that can only be done with collaborations." The same credo was put forward by EMBRAPA's Marilia Nutti, a food engineer who was also the first female director at the Brazilian Agricultural Research Corporation, when she led their Food Technology Center. EMBRAPA currently coordinates the biofortification network BioFort that fights malnutrition in Brazil through the improvement of 8 popular crops, with the release of recommended cultivars with the partnering hand of HarvestPlus. Thierry Tran from CIRAD pointed out a potential 'quick-win' for the RTB, a tool for diagnostic of energy use by small and medium enterprises: "RTB should identify and disseminate best practices to reduce energy use," he explained in his presentation on environmental aspects of RTB crops processing.

After two days of sharing experiences, the workshop was punctuated by a field trip to the beautiful Quindío region in thedepartment of Armenia, where I had the opportunity to talk to more partners. There, after a drive through a breathtaking scenery of lush green valleys, we visited plantain and cassava processing plants, before getting an insight into the dynamism behind the agribusiness in the region as illustrated by the explanations given by Silverio Gonzalez, the president of Colombia's Fedeplatano – Colombia's Federation of Plantain Producers - and by the visit to a cassava plantation managed by a young entrepreneur targeting supermarkets in Cali and Bogota.

During the trip I had the opportunity to hear from stakeholders whose dedication had them go back and forth between the academia and the field. "I won't be at the workshop tomorrow as I have classes to teach," apologized Martin Moreno Santander, a professor in agricultural engineering at the Universidad del Valle. "My dream is to build pilot equipment to dry cassava starch for trials. I work with students, we're looking at reducing the use of water, at increasing the plant productivity," he explained further.

On our way back to Cali, Juan Fernando Aguilar told me about his work at FHIA – the Honduran Foundation for Agricultural Research - and about his immediate interest when the creation of the RTB Research Program was being discussed, back in 2010. A specialist in biofortification, his interest (passion?) focuses on user preferences and the dissemination of new, vitamin-A-rich banana varieties. "We work with IDRC on a project to develop banana hybrids with a high content of Vitamin A. We did some tests six months ago and we selected 4 hybrids out of 100. But we need to do other tests at a much bigger scale." His end goal was all too clear, as he said "We should first see an improvement in the health of the farmers themselves, with less anemia in children and lactating mothers."

Taste is an important element when researching user preferences, something Dr. Dominique Dufour, Food Technologist and the workshop organizer, is fully aware of. So he could only give special care to the lunch we would have on the road: we tasted a typical “plato montañero” which had plantain, cassava and potato with meat in a special sauce. Such a hearty meal and inspiring visits were clearly – and cleverly - designed to give us strength to follow on the next two days with the workshop…

These previous exchanges were particularly helpful to get the team focus progressively around topics. Three groups were formed to develop plans for products and tools that would help deliver important outcomes for RTB. Every participant left with some homework to finalize full project proposals by May.

“Having people interact first and have them come slowly to common interests is a very smart approach,” appreciated FONTAGRO’s Executive Director Hugo Li Pun. “This is much better than imposing a rigid agenda on Day 1.”

By Véronique Durroux-Malpartida

ANNEX 6. KNOWLEDGE SHARING AND FRIENDSHIP SPAN INTERNATIONAL BORDERS

Teresa Sánchez has trained many people in her lab, and she has gained a lot from it.

While agricultural research is about progress and technology, it is also about people – the motivated and dedicated researchers whose work and collaboration make a world of difference for others. Teresa Sánchez, a research associate at the International Center for Tropical Agriculture (CIAT) is one of those people.

With Nigerian children
(photo: D. Dufour, CIAT)

I first met Teresa Sánchez when we both were in Nigeria. She was coming back from a cassava processing plant and looking forward to meeting with young Nigerian researchers who she had trained years earlier. A chemist specializing in food crops, Sánchez has been working at CIAT for the past 33 years and has accumulated a wealth of knowledge on cassava analysis during that time. From cyanide content to postharvest deterioration, she and her colleagues in the quality control lab test cassava for an array of traits that help CIAT breeders to select varieties and respond to the needs of small farmers, consumers and industry.

But Teresa Sánchez is no lab nerd. She is first and foremost a people person. For her lab also serves as a training center for many young researchers from developing countries who are eager to learn about quality-control methods and techniques. Undergraduates, postgraduates and PhD students from Colombia and other countries have joined her team over the years to learn how to do an array of analyses.

“Lately, we’ve welcomed students from Africa, in particular Nigeria, who are interested in the methodology for nutritional quality assessment,” Sánchez said, adding that those students return to their countries to apply the skills and knowledge they’ve acquired.

"CIAT offered me the opportunity to learn and to do my PhD dissertation in carotenoid profiles, antioxidant content and antioxidant capacity, and I worked with Teresa Sánchez on starch characterization," explained Ukom Anthony Nwanko, who spent five months at CIAT last year. He is currently Chief Technologist at the Department of Food Science and Technology at Abia State University in Nigeria, where he teaches students in his laboratory. "I have a fond memory of the researchers who helped me with my dissertation analysis, including Teresa," he wrote.

Etudaiye Hussein Adinoyi spent six months at CIAT in 2010. He is now a Principal Research Officer at the National Root Crops Research Institute (NRCRI) in Umudike, Nigeria. "While working under the supervision of Theresa Sánchez, we received about 93 cassava varieties of 3 replications from northern Colombia for some root quality traits analyses such as qualitative and quantitative evaluation of cyanide, dry matter and starch contents, and the detection of varieties that are tolerant to Post-Harvest Physiological Deterioration when stored for different periods," he explained. "I was trained on ethanol production and quality from cassava starch using a novo starch hydrolyzing enzyme called STARGEN 001. We studied the yields and qualities of ethanol produced from normal starch and waxy cassava starch, and the effects of root thickness, root diameter and root length on starch yield processed from the cassava varieties." When I visited Teresa Sánchez in her lab recently, I could tell that she and the small team she works with were thrilled with the recent renovations made to the lab with RTB support.

"We're even more motivated now that we're working in freshly-painted installations with state-of-the-art equipment," she observed, adding that RTB encourages more exchanges between centers and a wider range of research. Though 70% of the tests performed in her lab are on cassava, the remainder is on other RTB crops. "I believe that the RTB is helping to design a vision for the future," she said.

Sánchez explained that she works closely with CIAT cassava breeder Hernán Ceballos and food technologist Dominique Dufour: "I send them my results, and I benefit from their knowledge – we're a good team," she said with a smile. A milestone of that collaboration was their 2006

discovery of a new cassava variety called “waxy cassava,” which has turned out to be very important for the starch industry.

“I truly love my job – but I also meet friends through my job, and that’s the best part!” Sánchez told me. “I believe it’s Mother Teresa who once said: ‘One doesn’t need money, one needs friends’.”

By Véronique Durroux-Malpartida